29. A SPIDER AS PREDATOR OF *LAMPIDES BOETICUS* (LINNAEUS) (LEPIDOPTERA: LYCAENIDAE) FROM PUNJAB, INDIA

Pea blue butterfly, *Lampides boeticus* (Linnaeus) a polyphagous pest primarily of leguminous crops has been reported infesting 42 host plants (Singh 1982). A wasp, *Eumenes gracilis* Rauss as predator, *Microbracon greeni* Ashm. as larval parasite, *Trichogramma minutum, Trichogramma dendrolini, Trichogrammatoidea guamensis* as egg parasites have already been recorded as natural enemies of this butterfly (Alfieri 1916, Sen 1938, Sweez 1906, Nagarkatti and Nagaraja 1975).

The yellow nymphs of two spider species namely *Thomisus shivajiensis* Tikader (Thomisidae) and *Clubiona abboti* Koch (Clubionidae) were recorded feeding on the adults of *Lampides boeticus* in the pigeon pea fields around Ludhiana (Punjab). In the laboratory the butterflies were trapped in spider webs and killed immediately by sucking their internal body contents. The spiders never fed on the dead butterflies. It was observed that a spider took 49.60 ± 6.74 minutes to devour an adult.

ACKNOWLEDGEMENTS

We are grateful to the Prof.-cum-Head, Department of Entomology for facilities and Dr. G. L. Sadana, Assistant Professor, Department of Zoology, Punjab Agricultural University, Ludhiana for the identification of the spider species.

DEPARTMENT OF ENTOMOLOGY,
PUNJAB AGRICULTURAL UNIVERSITY,
LUDHIANA 141 004,
August 8, 1983.

JAGTAR SINGH
G. S. MAVI

REFERENCES

ALFIERI, H. A. (1916): Insect enemies of *Sesbania aegyptiaca* Pers. *Bull. Soc. ento. d. Egypte Cairo* Part I: 22-24.

NAGARKATTI, S. & NAGARAJA, H. (1975): Biosystematics of *Trichogramma* and *Trichogrammatoidea* species. *A Rev. Ent. 22*: 157-76.

SEN, H. K. (1938): Entomological Section: *Rep. Indian Lac Res. Inst. Namkum Calcutta,* 1937-38: 16-26.

SINGH, J. (1982): Biology and Chemical Control of Blue butterfly, *Cosmolyce* (*Lampides*) *boetica* Linn. (Lepidoptera: Lycaenidae) on pea (*Pisum sativum* Linn.). Unpubl. M. Sc. Thesis, Punjab agric. University, Ludhiana.

SWEEZY, O. H. (1906): Life history, notes and observations on three common moths. *Proc. Hawaii ent. Soc. 1*(2): 53-58.

30. SOME OBSERVATIONS ON THE BIOLOGY OF PLANORBID SNAIL *HELICORBIS COENOSUS* (BENSON) IN PUNJAB

(*With three text-figures*)

Helicorbis coenosus (Syn. *Segmentina coenosus*) is reported by different authors (Buckley 1939, Dutt and Srivastava 1966) to act as intermediate host of two important trematode parasites of man and pig in India, namely *Gastrodiscoides hominis* (Lewis & Mc-

Connel 1876) and *Fasciolopisis buski* (Lankester, 1857). This snail has been recorded in four districts, namely Amritsar, Ludhiana, Kapurthala and Ropar in a year round survey of the Punjab State. No account on the various aspects on the life history of this important snail of zoonotic importance was found in the literature, except a very preliminary work done by Tripathi *et al.* (1973). This paper records our observations about its life history under laboratory conditions.

TABLE 1

LABORATORY TEMPERATURE (°C)

Month	Mean air temperature		Mean water temperature	
	Daily range	Monthly	Daily range	Monthly
January	18.5-19.7	19.0	14.4-15.7	15.5
February	19.2-21.8	18.67	13.9-17.5	15.7
March	20.6-23.9	22.3	15.4-19.8	17.6
April	27.4-30.6	29.0	22.4-27.6	25.0
May	29.1-35.0	32.0	24.1-33.5	28.8
June	30.2-36.1	33.2	26.4-33.1	29.8
July	31.1-34.5	32.8	29.2-32.6	30.9
August	28.6-32.5	32.2	27.8-31.0	31.0
September	28.0-31.8	29.9	26.1-32.0	29.0
October	26.7-29.7	28.2	24.9-28.9	26.9
November	22.2-27.0	24.6	21.6-25.0	23.3
December	22.5-26.8	24.6	18.1-22.3	20.2

MATERIALS AND METHODS

Adult specimens of the snails were collected from a semi-dried pond at Katli village in Ropar district. Snails were reared in beakers of 500 ml. capacity, and fed with spinach (*Spinacia oleracea*) and *Trienthema govinda* (Hindi, *Santhi;* Punjabi, *Itsit*). Some decaying leaves and grass stems collected along with the snails were also kept in the beakers. A few plants of an aquatic weed *Hydrilla verticillata* were planted in the aquaria to serve as aerators and egg traps. The water of aquaria was changed once a week. Egg clutches laid by adult snails on the weed were collected and kept in Petri-dishes for development. Freshly hatched snails were transferred to different aquaria each containing one to three snails. In summer hatch group (March to May) and 18 in similar combinations in winter hatch group (Nov. and Dec.). Observations were recorded daily and any snail found dead was removed. Monthly size of the egg clutches, eggs and newly hatched snails was measured by eye piece micrometer and growing snails by slide calipers.

Temperature of the laboratory was regulated by using room heaters during winter and air conditioner during summer and temperature was recorded daily. Similarly water temperature of the glass aquaria was also recorded.

OBSERVATIONS

Laboratory air and water temperature is given in the table 1. From the table it can be seen that the daily mean air temperature varied from 19.2-36.1°C and monthly mean from 18.7 to 33.2°C. During winter months (Nov. and December) the mean monthly air temperature was 24.6°C. Mean water temperature for the month of November was 23.3 and for December it was 20.2°C.

During summer months (March to May) the mean air temperature varied from 22.3 to 30.0°C and mean water temperature varied from 17.6 to 28.8°C (Fig. 3).

Egg clutches. Leaves of the aquatic weed (*Hydrilla verticillata*) were found to be very congenial for egg laying as 99% of the egg clutches were found on them possibly as these were the only leaves available to the snails. Egg clutches were found firmly attached on the surfaces of dead leaves and stems. They were

TABLE 2

GROWTH RATE OF *Helicorbis coenosus* IN LABORATORY CULTURES

Age/ (Months)	Summer hatch Shell size (mm) Minimum L	B	Maximum L	B	Average L	B	Age/No. of snails	Winter hatch Shell size (mm) Minimum L	B	Maximum L	B	Average L	B
(A) Snail reared in groups													
1(10)	1.5	1.25	3.5	3.0	2.28	2.17	1(10)	—	—	—	—	—	—
2(10)	3.5	3.0	5.0	4.5	4.58	3.75	2(10)	1.5	1.0	4.0	3.0	2.85	2.25
3(10)	5.0	4.0	6.0	5.0	5.33	4.45	3(10)	2.75	2.0	5.0	4.0	3.38	2.55
4(10)	4.5	4.0	7.0	6.5	5.68	4.9	4(10)	2.75	2.0	5.25	4.0	3.98	3.0
5(10)	5.0	4.0	7.0	6.5	5.83	5.05	5(10)	2.75	2.0	6.5	6.0	4.78	4.1
6(10)	5.0	4.0	8.0	7.0	6.23	5.2	6(10)	3.0	2.0	6.5	6.0	5.43	4.75
(B) Snails reared singly													
1 (6)	2.0	1.5	3.5	3.0	2.70	2.25	1 (6)	—	—	—	—	—	—
2 (6)	3.0	2.5	6.0	4.0	4.50	3.58	2 (6)	1.5	1.0	3.5	3.0	2.29	1.75
3 (6)	3.5	2.5	7.0	6.0	5.37	4.33	3 (6)	2.75	2.0	4.5	4.0	3.29	2.41
4 (6)	4.0	3.5	7.0	6.0	6.41	5.16	4 (6)	3.0	2.0	6.0	5.5	4.37	3.50
5 (5)	4.5	3.5	7.25	6.0	6.10	5.10	5 (6)	3.75	3.0	7.0	6.5	5.45	4.66
6 (3)	5.0	3.5	7.5	6.25	6.66	5.25	6 (4)	5.5	4.0	7.0	6.5	6.37	5.37

Note: Figures in parentheses indicate number of snails.

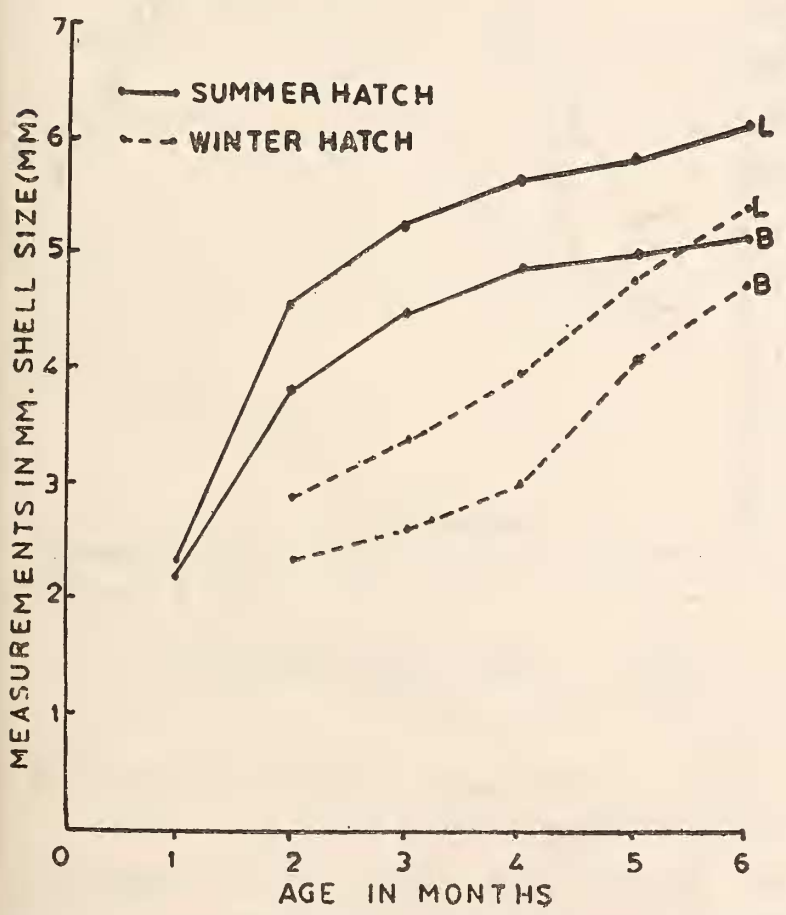

Fig. 1. Mean growth rate of Laboratory bred *Helicorbis coenosus*. (10) reared in groups.

suboval, round or elliptical. These clutches had an outer membrane enclosing a gelatinous material in which eggs varying from 1 to 22 were arranged in a characteristic fashion. Shape of the egg was roughly oval.

Thirty egg clutches brought in the month of November (Mean temp. 24.6°C) from the field biotope measured 1.0 × 0.75 to 4.75 × 3.0 (mean 2.70 × 1.72) mm). A number of eggs in these clutches ranged from 1-33. These eggs failed to hatch in the laboratory although the development in them was normal.

Growth. Data on the growth in shell size of the snail reared in groups of two or three both in summer and winter groups are presented graphically in figure 1, and single reared snail in figure 2. Monthly record of their development for both summer and winter hatch group is given in table 2. During summer hatch young snails under laboratory cultures attained the average size of 2.28 mm in

TABLE 3

NUMBER OF EGGS CLUTCHES & EGGS LAID BY *H. coenosus* IN LABORATORY CULTURES DURING MONTHS FOLLOWING FIRST OVIPOSITION AND MAXIMUM SIZE(S) REACHED BY SNAILS IN FULL LIFE SPAN.

No. of snails	No. of egg masses			Number of egg			Size of snails at the time of death		Life span
	Total	Total	Range	Mean	Total	Range	Mean	Range	Mean	(Months)
(A) SUMMER HATCH 65	970	0-134	14.92	6125	11-929	94.23	2.5 x 2.0 to 9.0 x 7.75	4.7 x 3.9		13
(B) WINTER HATCH 18	277	0-82	15.38	1692	0-591	94.0	3.0 x 2.0 to 7.25 x 6.0	5.5 x 4.7		10

length and 2.17 mm in breadth during the first month of their life. Average maximum length reached during the sixth month period for which the observations were recorded was 6.23 × 5.2 mm.

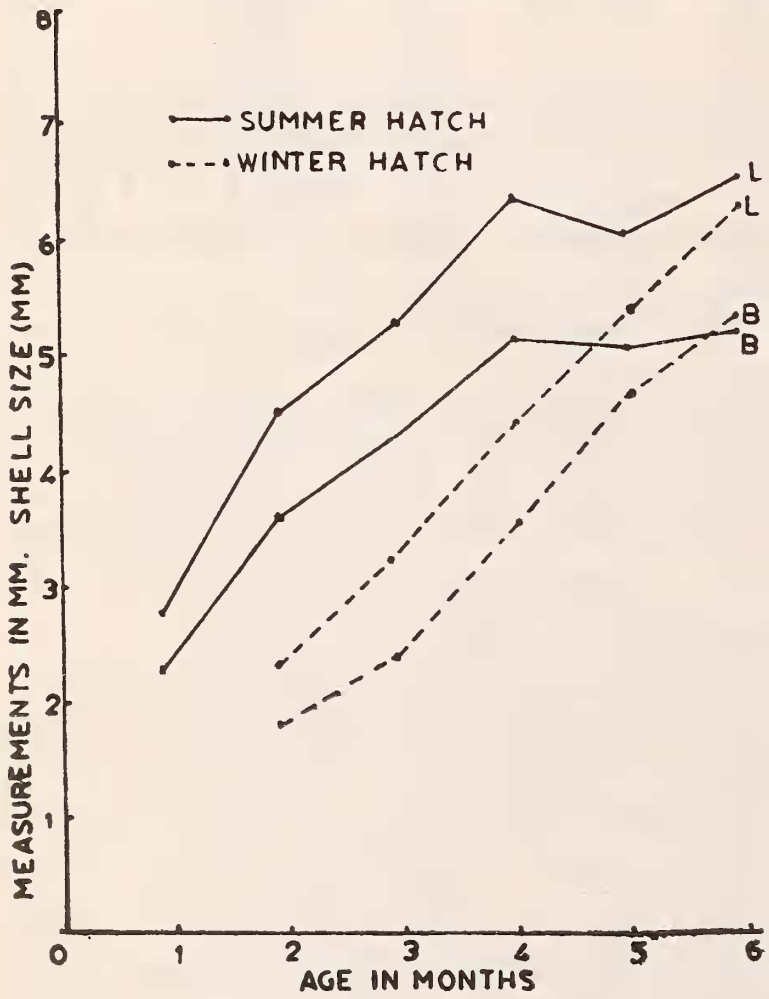

Fig. 2. Mean growth rate of Laboratory bred *Helicorbis coenosus*. (6) reared singly.

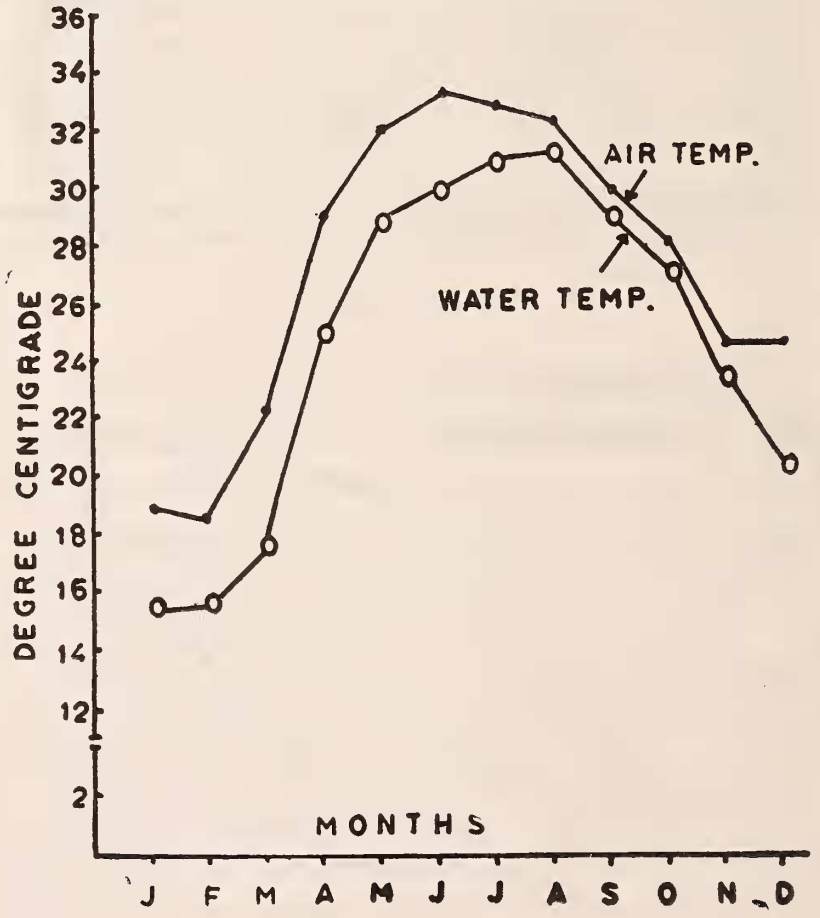

Fig. 3. Mean Room Temperature.

Singly reared snails attained the size of 6.66 x 5.25 mm during the same period.

In winter hatch snails the average size attained by the snails in six months was 5.43 × 4.75 mm whereas singly reared snails attain-

ed the size of 6.37 × 5.37 mm. during the same period.

Development in 65 snails maintained in 1, 2 and 3 snail groups in separate glass aquaria during summer months was recorded. Observations were recorded till they died. Eggs laid by the snails varied in size from 0.35-0.52 × 5.5-0.85 mm. No. of eggs in one clutch ranged from 1 to 33. First cleavage of embryo was noticed within 8 hours after deposition and vigorous movement of all embryo was observed after 12-15 hours. Hatching of eggs took place in 3-14 days when the daily temperature range was 29.1° to 35.0°C. Embryo was surrounded by yolk material which was enclosed in their vitelline membrane.

In winter hatch groups when the water temperature was below 23°C eggs ceased to hatch although the development of larvae within the egg clutches was normal and movement of juveniles within the eggs was seen.

Maturity & Fecundity. Snails became mature at the age of 26 to 52 days during summer months when the shell size ranged from 1.5 × 1.25 to 4.5 × 4.0 mm only 6.3% of the snails laid eggs when kept singly and the number of eggs laid in life time ranged from 0 to 216. Eight per cent of snails when kept in pairs or more in a laboratory culture laid eggs and the number in life time ranged from 0 to 929. Age of egg laying of the snail varied from 26 to 145 days.

In winter hatch groups temperature below 23°C the age of maturity was delayed. It reached upto 137 days although the size attained by such snails was 5.5 × 5.0 mm. Egg to egg cycle in this snail was completed in 4-20 weeks.

Longevity. The maximum longevity recorded was 13 months and the size reached by this snail was 8.0 × 7.5 mm. However, the maximum size of one snail recorded in laboratory was 9.0 × 7.5 mm in seven months in singly kept group.

ACKNOWLEDGEMENTS

We are grateful to Dr Johl, Director of Research, Punjab Agricultural University, Ludhiana and Dr Sawai Singh, Professor of Entomology and Head, Deptt. of Veterinary Parasitology for providing facilities.

DEPT. OF VETY, PARASITOLOGY,
PUNJAB AGRICULTURAL UNIVERSITY,
LUDHIANA,
May 8, 1981.

H. S. BALI
G. S. SRIVASTAVA

REFERENCES

BUCKLEY, J. J. C. (1939): Observations on *Gastrodiscoides hominis* and *Fasciolopsis buski* in Assam. *J. Helminth 171*: 1-12.

DUTT, S. C. & SRIVASTAVA, H. D. (1966): The intermediate host and the cercaria of *Gastrodiscoides homonis* (Trematoda: Gastrodiscidae). Preliminary Report. *J. Helminth*, Vol Nos. 1/2: 45-52.

TRIPATHI, J. C., SRIVASTAVA, H. D. & DUTT, S. C. (1973): A note on experimental infection of *Helicorbis coenosus* and pig with *Fasciolopsis buski*. *Indian J. Anim. Sci. 43*(7): 647-49: 649-649.